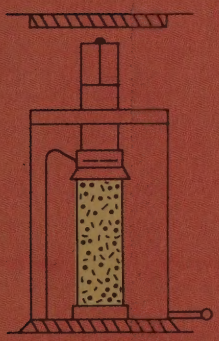
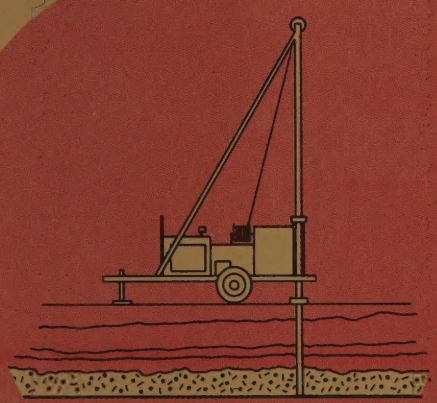
STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

SOIL MECHANICS
BUREAU





OVERLAY THICKNESS DETERMINATION

PIN 3500.52

I-81, Taft Road to Jefferson Co. Line

Oswego County

Novmeber 10, 1970

SM 238a (1/69)

MEMORANDUM
DEPARTMENT OF TRANSPORTATION

DATE November 10, 1970

SUBJECT P.I.N. 3500.52, I-81 TAFT ROAD TO JEFFERSON COUNTY LINE, OSWEGO COUNTY, TRANSMITTAL OF REPORT "OVERLAY THICKNESS DETERMINATION"

FROM Wm. P. Hofmann, Bureau of Soil Mechanics, Room 102, Bldg. 7
By Robert J. Weaver
TO M. D. Graham, Facilities Design Subdivision, Room 404, Bldg. 5
cc R. H. Edwards, Preliminary Plan Review Bureau, Room 408, Bldg. 5
E. E. Towlson, Region 3
G. W. McAlpin, Technical Services Subdivision, Room 213, Bldg. 7
W. C. Burnett, Engineering Research & Development Bureau, Executive Plaza
F. W. Memmott, Program Analysis Bureau, Room 310, Bldg. 5

In accordance with a request, dated June 22, 1970, by Mr. W. H. Ketchum, Regional Design Engineer, Region 3, we have performed a present serviceability survey of the pavement on this project, and have prepared an overlay thickness design. The report transmitted herewith contains our design analysis. Also included in the report are:

1) A traffic analysis prepared by the Program Analysis Bureau.

2) The tabulated results of the present serviceability survey.

Based on our analysis, we recommend that the pavement on this project be resurfaced using 2-1/2 inches of Item 51-F-Asphalt Concrete-Type 1A (mixing method-two course) over Item 51TL-Asphalt Concrete Truing and Leveling Course.

ARS:SAS

NYSDOT
Library
50 Wolf Road, POD 34
Albany, New York 12232

MEMORANDUM
DEPARTMENT OF TRANSPORTATION

DATE October 5, 1970

SUBJECT INTERSTATE ROUTE 81
PIN 3500.52, PAVEMENT ANALYSIS
TAFT ROAD TO JEFFERSON COUNTY LINE, OSWEGO COUNTY

FROM F. W. Memmott, Program Analysis Bureau, Room 301, Bldg. 5 FWM

TO W. P. Hofmann, Soil Mechanics Bureau, Room 102, Bldg. 7

To assist you in the preparation of the pavement design analysis for the subject project, we are enclosing ten copies and the original of the necessary traffic analysis.

In summary, we find from our analysis that:

1) The equivalent 18,000# axle loads estimated to have occured on one lane of the project pavement from the time of its opening to traffic in 1961 until the time the serviceability index (P_t) was reduced to 2.5 (1969) is 860,013. The structural number used for this 9-year period was 4.0 and the average daily loading (ADL) was estimated to be 261.80.

2) The equivalent 18,000# axle loads estimated to occur on one lane of the project from 1970 to the design year of 1979 is 1,498,435. A structural number of 5.0 and a serviceability index (P_t) of 2.0 was used for this 10 year period. The average daily loading (ADL) for this same 10 year period was estimated to be 410.53.

FWM/DAG/JMW
Enclosures

B. S. M.
1 WPH
LHM
SM
JJO
BM
WPM
RSG
Ar.SE
BEB
WRB
RSC
ECH
VCM
RLG
RCH
RHB
JBF
EAF
FHM
FRI
JRH
VB
2 RJW
3 ARS
FILE

10/5/70
Compiled by D. Graudons

TRAFFIC DATA FOR DETERMINATION
OF OVERLAY THICKNESS

PROJECT

Interstate Route 81
Taft Road to Jefferson Co. Line
Oswego County
PIN 3500.52

Study Limits

This analysis is limited to the northernmost 10.3 miles of project 3500.52. The section of I-81 that is to be studied starts approximately 10.3 miles south of the Oswego-Jefferson County Line in Oswego County and runs northerly to the Jefferson County Line.

General Information

Reference, BPR circular memorandum dated May 9, 1967 from G. M. Williams.

The applicable design periods and design years, for the pavement structure, for these estimate section types are restated hereafter:

(a) N/A
(b) Projects constructed with FAI funds for which the pavement construction was authorized prior to October 24, 1963.

The design period is twenty years after the date of authorization for construction of the initial pavement construction project, etc.
(c) N/A
(d) N/A

Reference, March 19, 1969 memorandum from G. M. Williams.

Establish Traffic Data for the following:

(a) The total equivalent 18-kip single axle load application that will have passed over the traffic lane of the pavement structure during the period of time from its initial opening to traffic to the date when the serviceability index (P_t) will be 2.5 and the overlay is to be placed.

(b) The total equivalent 18-kip single axle load applications that will have passed over the traffic lane of the pavement structure during the period of time from its initial opening to traffic to the time that the pavement on which an overlay has been placed will have a serviceability index (P_t) of 2.0, which traffic and time period are represented in design at least by a twenty year design period.

Lane Distribution

Reference: Highway Capacity Manual, page 106 "On Upgrades . . . most of the trucks stay in Lane 1, ..."

Assumptions: ninety-five percent of the lighter trucks use Lane 1. One hundred percent of the heavier trucks use Lane 1. Since passenger cars have little effect on pavement design, assume forty percent in Lane 1 and sixty percent in Lane 2.

SECTION DATA: (FROM TABLE AW-2)

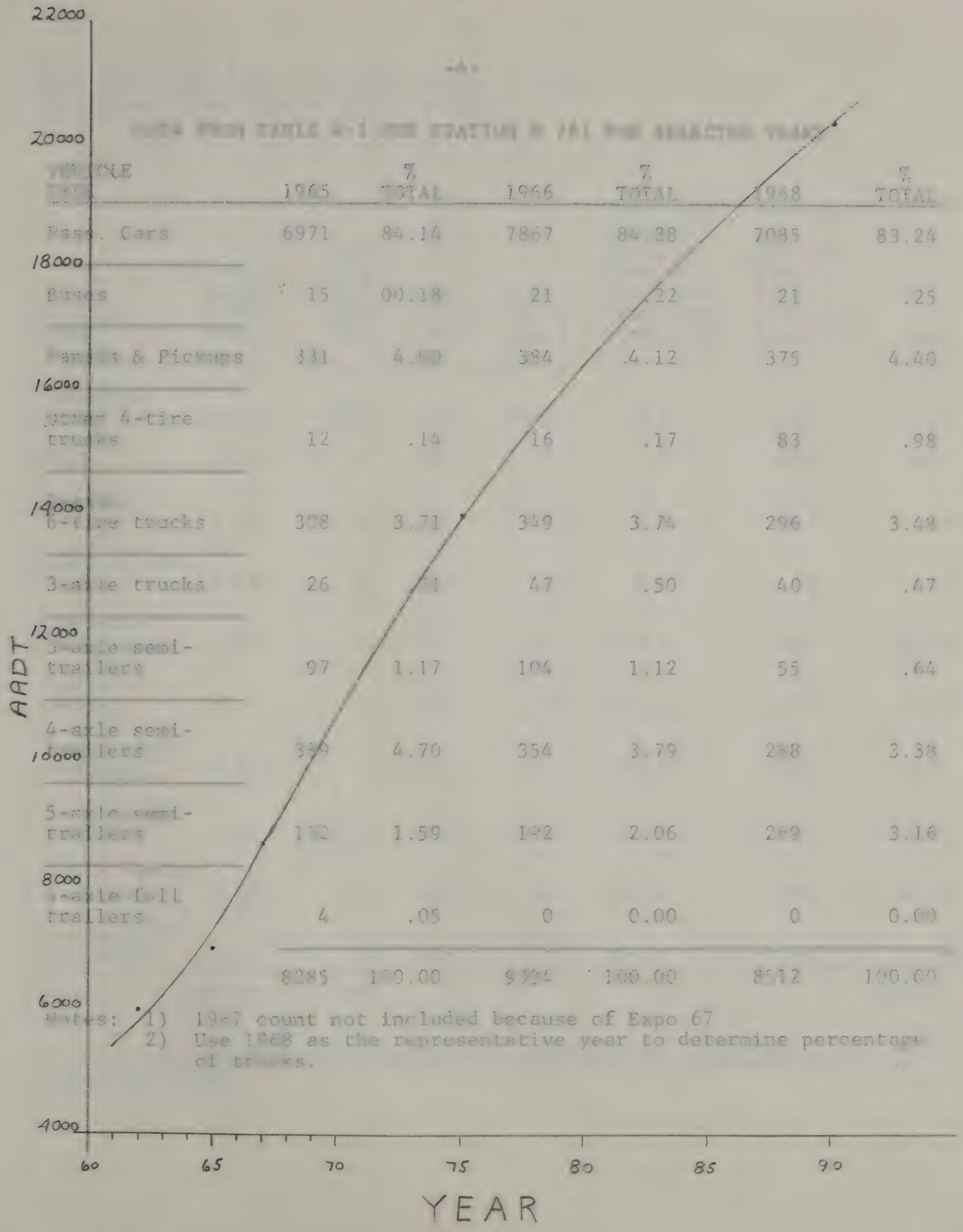
Proj. No.	Section	Pavement Authoriz.	Pave. open to Traffic	Pavement Design Yr. by Law	Mileage
3500.52	B16 minus 10.3 mi.-B16	1959	1961	1975	10.3

AADT (FROM INTERSTATE COST ESTIMATES)

Section	Year Open To Traffic	1962	1965*	1967	1975	1990
B16 minus 10.3 miles-B16	1961	6000	7000	8725	14000	20400

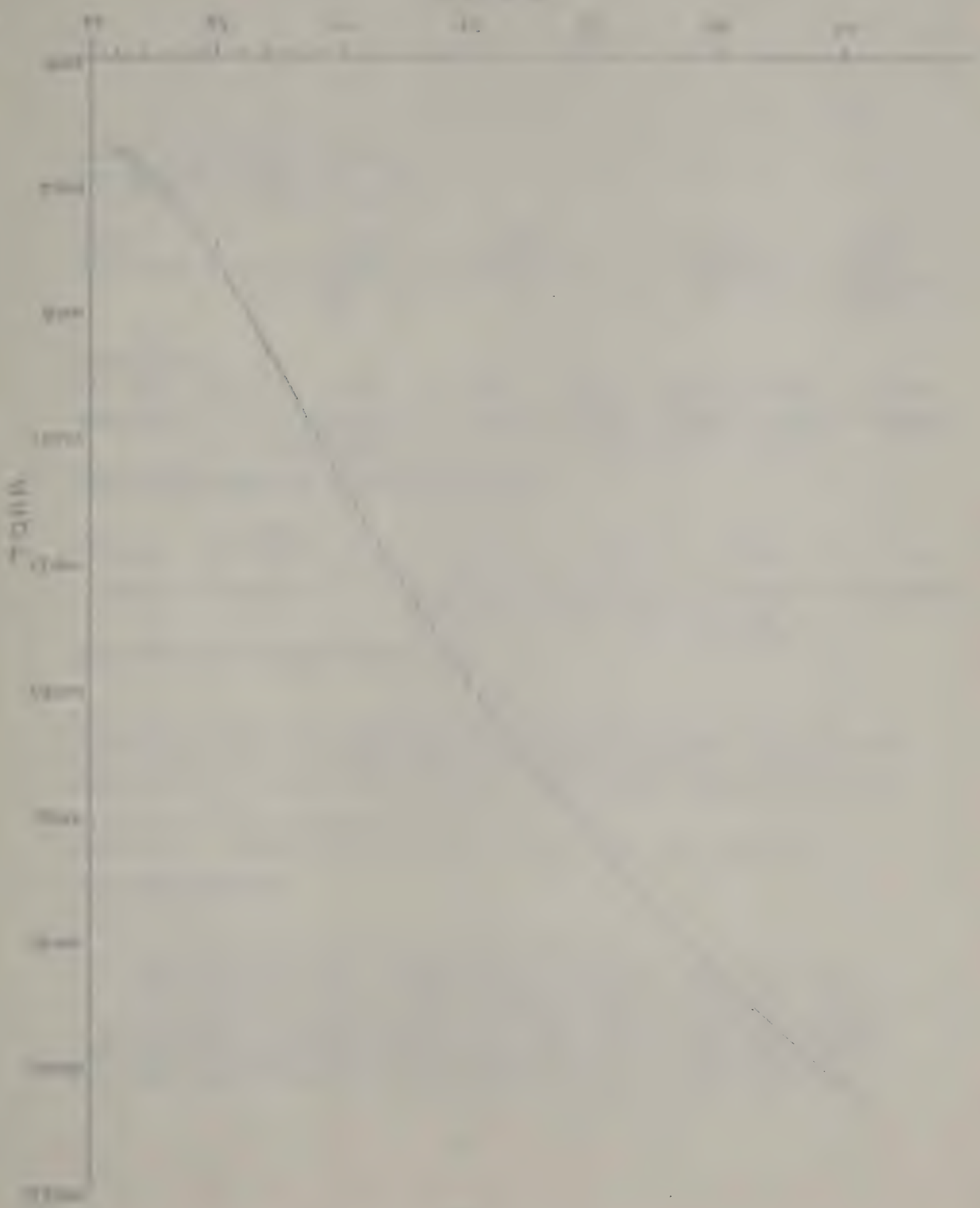
	Open to Traffic	P_t = 2.5	Overlay	Design Year***
Year	1961	1969	1970	1979
AADT**	5400	10000	10800	16000

*Adjusted (From TF-2 Tables)
**From plot of AADT vs. year
***See General Information



VEHICLE TYPE	1965	% TOTAL	1966	% TOTAL	1968	% TOTAL
Pass. Cars	6971	84.14	7867	84.28	7085	83.24
Buses	15	00.18	21	.22	21	.25
Panels & Pickups	331	4.00	384	4.12	375	4.40
Other 4-tire trucks	12	.14	16	.17	83	.98
6-tire trucks	308	3.71	349	3.74	296	3.48
3-axle trucks	26	.31	47	.50	40	.47
3-axle semi-trailers	97	1.17	104	1.12	55	.64
4-axle semi-trailers	389	4.70	354	3.79	288	3.38
5-axle semi-trailers	132	1.59	192	2.06	269	3.16
4-axle full trailers	4	.05	0	0.00	0	0.00
	8285	100.00	9334	100.00	8512	100.00

Notes: 1) 1967 count not included because of Expo 67
2) Use 1968 as the representative year to determine percentage of trucks.



DATA FROM TABLE W-1 FOR STATION # 781 FOR SELECTED YEARS

VEHICLE TYPE	1965	% TOTAL	1966	% TOTAL	1968	% TOTAL
Pass. Cars	6971	84.14	7867	84.28	7085	83.24
Buses	15	00.18	21	.22	21	.25
Panels & Pickups	331	4.00	384	4.12	375	4.40
Other 4-tire trucks	12	.14	16	.17	83	.98
2-axle 6-tire trucks	308	3.71	349	3.74	296	3.48
3-axle trucks	26	.31	47	.50	40	.47
3-axle semi-trailers	97	1.17	104	1.12	55	.64
4-axle semi-trailers	389	4.70	354	3.79	288	3.38
5-axle semi-trailers	132	1.59	192	2.06	269	3.16
4-axle full trailers	4	.05	0	0.00	0	0.00
	8285	100.00	9334	100.00	8512	100.00

Notes: 1) 1967 count not included because of Expo 67
2) Use 1968 as the representative year to determine percentage of trucks.

P_t = 2.5; SN = 4.0
Mean AADT 1961-1969 = (5400+10,000)/2 = 7700
Directional Mean AADT = 7700/2 = 3850

Vehicle Type	% from counts or forecasts	Dist. of ½ AADT 1961-1969	% of Veh.in Lane 1	Dist. Veh.in Lane 1	18K axle Equiv. P_t=2.5 SN=5.0 From W-4 Rate/1000 1966 Data	Converts to 18K axle Equiv. P_t=2.5 SN=4.0 Rate/1000	ADL
Passenger Cars	83.24	3204	40	1282	0.8	1.0	1.28
Buses	0.25	10	95	10	257.0	284	2.84
Panels & Pickups	4.40	169	95	161	2.1	2.6	.42
Other 4-tire trucks	0.98	38	95	36	8.1	10	.36
2-axle 6-tire trucks	3.48	134	95	127	254.0	281	35.69
3-axle trucks	0.47	18	95	17	641.4	662	11.25
3-axle semi-trailers	0.64	25	100	25	528.3	567	14.18
4-axle semi-trailers	3.38	130	100	130	834.1	865	112.45
5-axle semi-trailers	3.16	122	100	122	645.7	683	83.33
4-axle full trailers	0.00	0	100	0	834.1	865	0.00
TOTAL	100.00	3850					261.8

Total 9-year 18,000# axle loadings - 9 (365)(261.8) = 860,013
Years 1961-1969

P_t = 2.0; SN = 5.0
Mean AADT 1970-1979 = (10,800+16,000)/2 = 13,400
Directional Mean AADT = 13,400/2 = 6,700

Vehicle Type	% from counts or forecasts	Dist. of ½ AADT 1970-1979	% of Veh. in Lane 1	Dist. of Veh. in Lane 1	18K axle Equiv. P_t=2.5 SN=5.0 From W-4 Rate/1000 1966 Data	Convert to 18K axle P_t=2.0 SN=5.0 Rate/1000	ADL
Passenger Cars	83.24	5577	40	2231	0.8	0.7	1.56
Buses	0.25	17	95	16	257.0	239.0	3.82
Panels & Pickups	4.40	295	95	280	2.1	1.8	.50
Other 4-tire trucks	0.98	66	95	63	8.1	7.2	.45
2-axle 6-tire trucks	3.48	233	95	221	254.0	236.0	52.16
3-axle trucks	.47	31	95	29	641.4	622.0	18.04
3-axle semi-trailers	.64	43	100	43	528.3	499.0	21.46
4-axle semi-trailers	3.38	226	100	226	834.1	806.0	182.16
5-axle semi-trailers	3.16	212	100	212	645.7	615.0	130.38
4-axle full trailers	0.00	0	100	0	834.1	806.0	0
TOTAL	100.00	6700					410.53

Total 10-year 18,000# axial loading = 10 (365)(410.53) = 1,498,435
Years 1970-1979

RECEIVED
OCT 8 - 1970

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU

November 1970

Interstate 81, Taft Road to Jefferson County Line
Oswego County
P.I.N. 3500.52

PAVEMENT SERVICEABILITY SURVEY

Test Section	Year of Survey[a]	Roughness in ins/mi[b] (R)	Ave. Rut Depth in ins. (RD)	Cracking & Patching in ft^2/1000 ft.^{2} (C+P)	Present Serviceability Index[c] (PSI)	Present Serviceability Rating[d] (PSR)
34-21-1	1966	81.2	0.239	0	3.16	-
	1970	-	0.284	8	-	-
34-21-2	1966	87.4	0.348	0.3	2.55	-
	1968	87.8	0.345	0	2.59	-
	1969	113.0	0.408	1.3	1.94	-
	1970	-	0.346	203	(1.64)[e]	-
34-21-3	1966	70.0	0.225	0	3.41	-
	1968	80.0	0.213	0	3.29	-
	1969	99.9	0.248	0	2.83	-
	1970	-	0.238	10.2	(2.67)[e]	-
34-21-4	1970	-	0.366	13.7	-	-
Project	1970	-	-	-	-	2.03

a 1970 survey performed by Soil Mechanics Bureau and Region 3 personnel. Previous surveys performed by the Engineering Research and Development Bureau.

b Roughness values were not obtained in 1970 because of a breakdown of the Roughometer used by the Department.

c The Present Serviceability Index is determined from the following formula:

$$\ln PSI = 1.73 - 0.0053R - 2.67(RD)^2 - 0.0022\sqrt{C+P}$$

d The Present Serviceability Rating is based on the evaluation of the rideability of the highway by a panel of raters.

e PSI values in parentheses are based on RD and C+P values determined in 1970 and on R as determined in 1969.

STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION

SOIL MECHANICS BUREAU

PROJECT: PIN 3500.52 I-81 Sheet 1 of 2 Sheets
Taft Rd. to Jefferson Co. Line Prepared by: A.R. Schnorr Date 11-6-79
Oswego County Checked by: Date

DESIGN OF PAVEMENT OVERLAY

(Ref.: AASHO Interim Guides)

A. Known

1. Authorized 1959, ∴ design year = 1979.
2. Constructed under Contract F 151 53-22.
3. Open to traffic 1961.
4. Pavement section (from plans):

2 1/2 ins	Item 51	asphalt concrete surfacing
3 "	" 451X	" " base
4 "	" 45X	broken stone, slag, or gravel base
6 "	" 39A	sand & gravel subbase
6 "	" 39	" " "

B. Assumptions

1. ADL (1961 to 1969) = 261.80 18 KEAL's
2. ADL (1970 to 1979) = 440.53 18 KEAL's
3. Present Serviceability Index of 2.5 reached in 1969
4. Coefficients of relative strength:

Item 51	$a_1 = 0.44$
" 451X	$a_2 = 0.34$
" 45	$a_2 = 0.14$
" 39A	$a_3 = 0.11$
" 39	$a_3 = 0.11$

5. Regional factor (K) = 2.

M 273 (12/67)

STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION

SOIL MECHANICS BUREAU

PROJECT: PIN 3500.52 Sheet 2 of 2 Sheets

Prepared by: A.R. Salmons Date 11-6-70

Checked by: Date

C. Computations

1) Total 18 KEAL's mid-1961 to mid-1969 =

= 261.8 × 8 × 365 = 764,000

2) " " " mid-1969 to mid-1979 =

= 410.53 × 10 × 365 = 1,498,434

3) " " " mid-1961 to mid-1979 = 2,262,434

4) SN of existing pavement

Item 51	: .44	× 2.5	= 1.10
" 45 SR	: .34	× 3	= 1.02
" 45	: .14	× 4	= .56
" 39 & 39A	: .11	× 12	= 1.32
		SN	= 4.00

5) Determine soil support value (S)

Use chart 400-2

for above values of SN & R and 764,000 18 KEAL's

S = 3.3

6) Determine SN needed to give PSI (p_t) = 2.0 in 1979

Use chart 400-1

for above values of S & R and 2,262,434

SN = 4.45

7) Thickness of overlay = $\frac{0.45}{0.44}$ = 1.02 ins.

Use minimum overlay thickness : 2½ ins Item 51

over Item 51 TL truing & leveling course.

M 273 (12/67)

00284
LRI